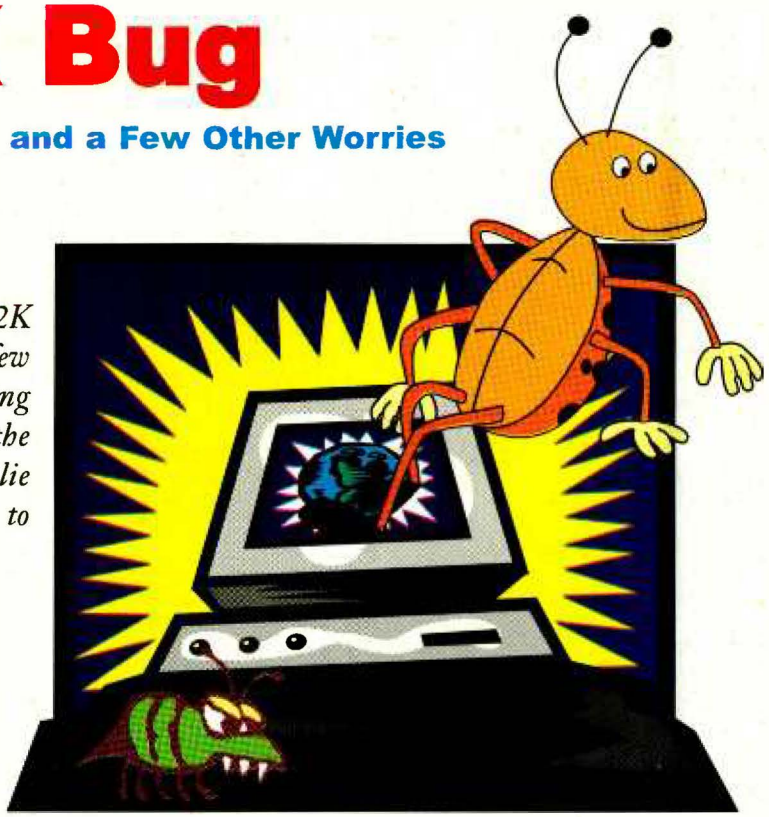
The Y2K Bug

and a Few Other Worries



While almost everyone is aware of the Y2K bug, many don't know that there are a few other nasty date-related surprises lurking out there. This survival guide gives you the lowdown on what problems might lie ahead, and what precautions you need to take to survive the coming bug season.

BOB DYBALL AND GREG SWAIN

Suppose someone mentioned these dates: August 21, 1999, September 9, 1999, February 29, 2000, and January 18, 2038? Would they mean anything to you? No?—Then how about an easy one? What about December 31, 1999?

Of course the latter will immediately evoke a response. It's the end of the century and the end of the, millennium—a time for parties and revelry, and perhaps a little paranoia. Of course, as purists will quickly point out, the millennium does not really end until December 31, 2000, but since the rollover from the year 1999 to the year 2000 seems far more significant to most than the actual end of the millennium, who are we to argue?

However, whether you hold the pedantic or popular view on the end of the millennium, December 31, 1999 will likely be a date you remember for a long time, no matter how hung over you are from that night's parties. The reason is the so-called Y2K bug that makes it virtually a certainty that at least a few computers will cease to work correctly at midnight on that day. What will be the impact of that? It could be negligible or catastrophic. In fact, if you listened to some of the most extreme predictions of doom and gloom, you could be forgiven for wondering if the Earth will stop spinning at midnight on that date.

How could this have happened? Are the predictions of doom justified or overblown? What can you do to minimize any effects on your computer systems or your life? We'll tackle those questions a little later in this article. First, however, we are going to see if we can ratchet up your paranoia level by introducing you to a few more memorable dates. While these have not had the exposure that the Y2K bug has, they could make your life nearly as miserable. Buckle up, because here we go:

August 21 1999. What's the significance of this seemingly innocuous date? Well, that date is the week-zero rollover for GPS navigation systems.

In greater detail, August 21, 1999 is the last day of week 1023 of the GPS system. However, the system was only designed to count from 0 to 1023 in the first place. This means that on August 22, 1999, the GPS satellites will be broadcasting that it is week 0.

It is expected that some GPS ground systems will just stop working, having severe problems with the rollover. Others may need only a simple modification, though it might entail sending it back to the factory to make sure that they continue working properly and display August 22, 1999 instead of January 6, 1980, or something worse.

Most GPS systems manufactured over the last couple of years should have no problems, but be sure to check with your supplier. If you have a GPS mapping system for your computer, it might also pay to check now for any updates. More information on this, as well as useful links on the subject, can be found on a Web site maintained by the U.S. Coast Guard; see the box entitled Y2K Web Sites for the URL.

September 9, 1999 (9/9/99). This could be a real sleeper in some applications. That's because software writers occasionally used 9/9/99 to indicate unknown infor-

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mation. Basically, this was a date that was never supposed to happen during the life of the program. It means that some applications will fail before the year 2000 is reached.

February 29, 2000. The year 2000 is a leap year but apparently not all systems or applications will recognize it as such and will miss the day altogether. Such systems will incorrectly roll from February 28, 2000 to March 1, 2000.

The reason for this confusion is that the year 2000 is a special case that occurs once every 400 years. The rule governing leap years is that a year is a leap year if it is divisible by four but not by 100. However, there is an exception: if the year can be divided by 400, then it is a leap year.

Confused? Let's look at the year 1900. It is divisible by four and by 100 but not by 400, so it wasn't a leap year. However, the year 2000 is divisible by 400, so it is a leap year.

As a result, many sources suggest that the system be checked to ensure that it rolls correctly from the February 28 to February 29, 2000, and from there to March 1, 2000. In fact, most year-2000 diagnostic utilities (more on those later on) automatically check the system to ensure that the leap year will be handled correctly.

That said, there's a wealth of opinion that states that the leap year problem doesn't exist since a standard computer real-time clock (RTC) automatically provides for a leap year if the year is divisible by four. This means that the year 2000 will be correctly interpreted as a leap year, but it won't hurt to check anyway.

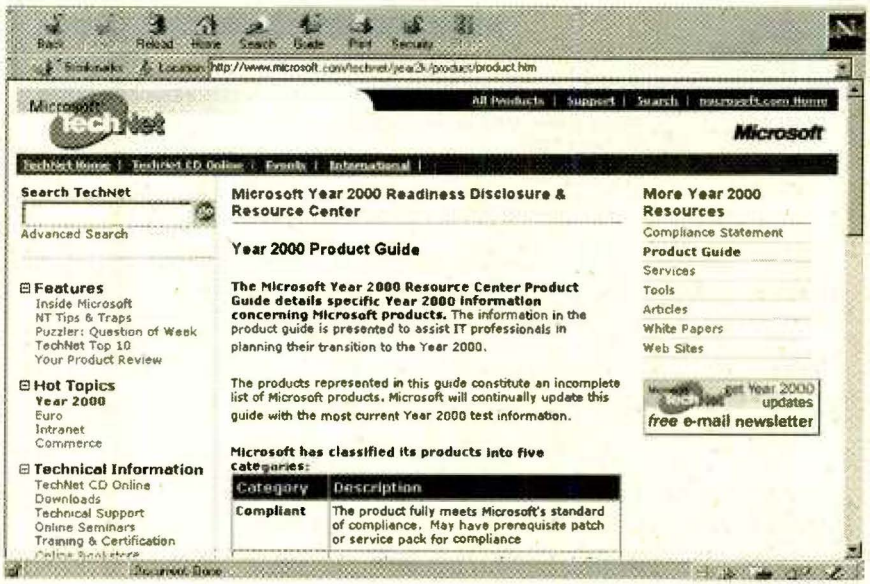
January 18, 2038. Talk to anyone with UNIX, or a UNIX-related system, and they'll probably be laughing at PC and Windows users who are sorting out the Y2K problem. Why? Well UNIX applications usually (but not always) use a special date/time library (CTIME) in which dates start from 1970 and don't run out until January 18, 2038. On that date, however, UNIX systems have their own real problem because the date resets to 1970 again! Note, however, that some UNIX systems could still have problems after 12/31/99 as some applications might deal with dates in a 2-digit manner.

December 31, 1999. Given the publicity, it is unlikely that anyone out there has not heard of the Y2K bug, also know as the year-2000 bug or the millennium bug. It of course refers to the fact that many computer systems will not roll over correctly from December 31, 1999 to January 1, 2000. Instead, they will roll over to 1900 or 1980 instead.

passed on to the system BIOS each time the machine boots.

When the RTC was first introduced in PC-architecture machines, eight bits were set aside to hold the year. Since that is only enough for two digits, the century information was stored in non-volatile memory in the clock chip; combining the century data in memory with the year data, yields a full four-digit year.

But there was a critical design error here. All early RTCs, and even some more modern ones, provide


Microsoft TechNet
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Puzzler: Question of Week
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Year 2000 Product Guide
The Microsoft Year 2000 Resource Center Product Guide details specific Year 2000 information concerning Microsoft products. The information in the product guide is presented to assist IT professionals in planning their transition to the Year 2000.
The products represented in this guide constitute an incomplete list of Microsoft products. Microsoft will continually update this guide with the most current Year 2000 test information.
Microsoft has classified its products into five categories:
Category
Description
Compliant
The product fully meets Microsoft's standard of compliance. May have prerequisite patch or service pack for compliance
More Year 2000 Resources
Compliance Statement
Product Guide
Services
Tools
Articles
White Papers
Web Sites
Year 2000 updates
free e-mail newsletter

Microsoft's year 2000 Web site includes detailed compliance information on operating systems and applications. It also includes Y2K fixes that can be downloaded and applied to problem programs.

The older the computer the more likely it is that it has the Y2K bug. The bug will also affect many applications programs; again, the older the application, the more likely it is that it will suffer year-2000 problems.

So how did this come to be? Basically, the problem can be traced back to the early days of computing and the practice of using only two digits to represent the year. That practice, possibly introduced to save storage space, was subsequently carried over to the age of the PC.

If you "dig down" into the hardware of a PC, you'll find a real-time clock (RTC) chip. The RTC keeps track of the time and date and updates the CMOS memory, which is backed up by an onboard battery when the machine is off. The year information in the CMOS is

no way to update the century memory location. Because of that, things break down when we get to the year 2000. At that point, the RTC rolls the year from 99 to 00 but the century in memory remains fixed at 19. As a result, the RTC reports the date as January 1, 1900 instead of January 1, 2000.

What happens next depends on the system BIOS, or more specifically on what type of BIOS is built into the PC. When the machine is rebooted, some BIOSes will simply reflect what is in the system clock and will show 01/01/1900. Other BIOSes will interpret year 00 as 01/01/1980. As a result, the system rolls over from either 1999 to 1980 or from 1999 to 1900.

However there is a complicating factor. Microsoft operating systems (Windows and DOS 6.22) don't recognize 1900 as a valid date.

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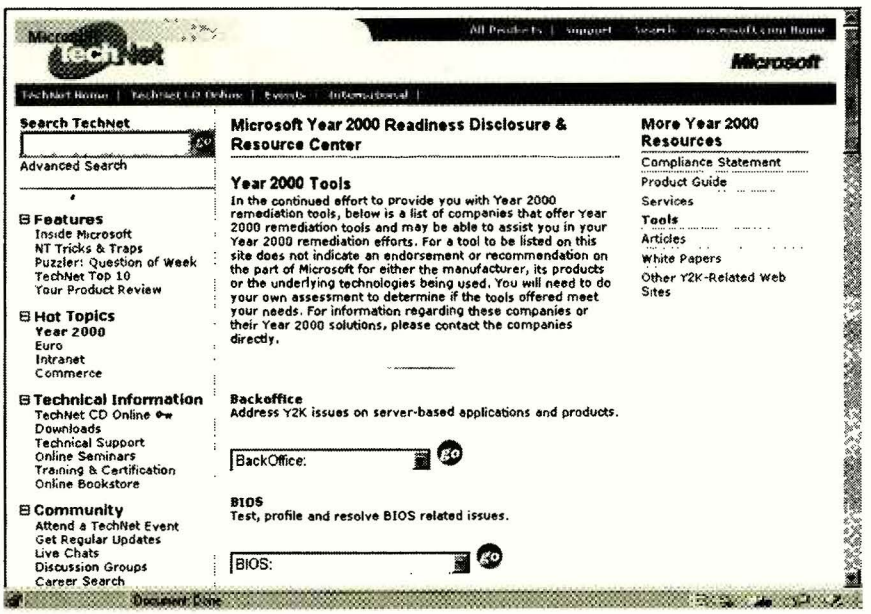
Instead, when the operating system boots, it automatically resets the system clock to January 4, 1980; or at least, this is what happens with DOS 6.22, Windows 3.1x, and Windows 95.

Windows 98, Windows NT 3.51 (Service Pack 5), and Windows NT 4 behave differently. According to Microsoft, those operating systems include a BIOS "fix" that automatically resets the year 1900 to 2000. However, some BIOSes will revert to 1900 every time the system reboots.

What's more, if the BIOS date reverts to 01/01/1900 or 01/01/1980, the operating system date will also be incorrect when the machine is next rebooted. However, if you manually correct the date in CMOS setup, many machines will maintain the correct setting from that point on and even rebooting will not cause any problems.

The Award 4.50g BIOS can pose particular problems. Some versions of this BIOS will not allow any year that's less than "94", which means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Puzzler: Question of Week
TechNet Top 10
Your Product Review
Hot Topics
Year 2000
Euro
Intranet
Commerce
Technical Information
TechNet CD Online
Downloads
Technical Support
Online Seminars
Training & Certification
Online Bookstore
Community
Attend a TechNet Event
Get Regular Updates
Live Chats
Discussion Groups
Career Search
Microsoft Year 2000 Readiness Disclosure & Resource Center
Year 2000 Tools
In the continued effort to provide you with Year 2000 remediation tools, below is a list of companies that offer Year 2000 remediation tools and may be able to assist you in your Year 2000 remediation efforts. For a tool to be listed on this site does not indicate an endorsement or recommendation on the part of Microsoft for either the manufacturer, its products or the underlying technologies being used. You will need to do your own assessment to determine if the tools offered meet your needs. For information regarding these companies or their Year 2000 solutions, please contact the companies directly.
Backoffice
Address Y2K issues on server-based applications and products.
BackOffice:
GO
BIOS
Test, profile and resolve BIOS related issues.
BIOS:
GO
More Year 2000 Resources
Compliance Statement
Product Guide
Services
Tools
Articles
White Papers
Other Y2K-Related Web Sites

The Microsoft year 2000 Web site has links to numerous "Year 2000 Tools" that can be used to assess Microsoft products. There are also links to numerous third party suppliers with Y2K diagnostic utilities, some of which can be downloaded for free.

In that case, Microsoft's BIOS fix will only work until the year 2001 is reached. When that happens and the system BIOS rolls over to 1901, the fix will not work and the operating system will revert to 1980.

Now let's inject an air of reality here. Generally, it's older machines that have BIOSes with this type of problem. You're not likely to be running Windows NT or Windows 98 on a 486, and if you are, it's probably time for an upgrade anyway!

Note that if a non-compliant machine is left running during the rollover, the DOS date will be updated correctly to 01/01/2000. However, that doesn't necessarily mean that all applications will work correctly. Some applications take the date from the BIOS rather than from the operating system.

that 1900 becomes 1994 and 2000, 2001, 2002, *etc.* become 2094. This means that the machine will roll over from 1999 to 1994 and you cannot correct the situation by manually resetting the BIOS clock.

Although many RTCs in recent machines are still technically non-compliant, a "fix" is incorporated into the BIOS to overcome the Y2K problem. Basically, the BIOS corrects the date in the CMOS at bootup time and that is subsequently passed on to the operating system. Most (but not all) of the later Pentium machines fall into this category and so will correctly rollover to the year 2000.

In summary, the CMOS RTC almost always fails to increment from 1999 to 2000 (except for the very latest RTCs), but this usually doesn't matter—very few programs access it directly (and these would now usually be considered obsolete). What does matter is whether the BIOS fixes the problem so that both the BIOS and operating-system dates are correct.

Testing Your System. So how can you check to see if your system rolls over to the year 2000 correctly? Well, you could reset your system clock to a few minutes before midnight on 12/31/99, but that might not be the best idea as there could be unforeseen consequences.

For example, if you have a program that is only registered for a certain period of time, it might stop working. In addition, anything that schedules events, including e-mail delivery, could cause lots of problems. Even year-2000 compliant applications could cause problems if you move the clock forward to the year 2000, run the program, then change the clock back again.

Instead, the best way to test your system is to use a bootable floppy disk (created using DOS 6.22 or later). That way, you can avoid writing any information to the hard disk, which might alter vital files. Make sure that the machine on which you create the bootable floppy is clean of viruses, then change the boot order in your BIOS (CMOS) setup to A: C: (normally it should be on C: A: or C: only, to prevent accidental infection if a virus-infected disk is left in the A: drive).

Although not considered totally reliable, a manual check can give a good indication as to how your system will behave when the year 2000 ticks over. The basic procedure involves setting the system clock to one minute before midnight on 12/31/1999 and then observing what happens when the system rolls over into the year 2000. However, to property determine the system's behavior, you need to test two conditions:

(1) What happens if the machine is switched off during the rollover; and

(2) what happens if the machine is left switched on during the rollover and then rebooted.

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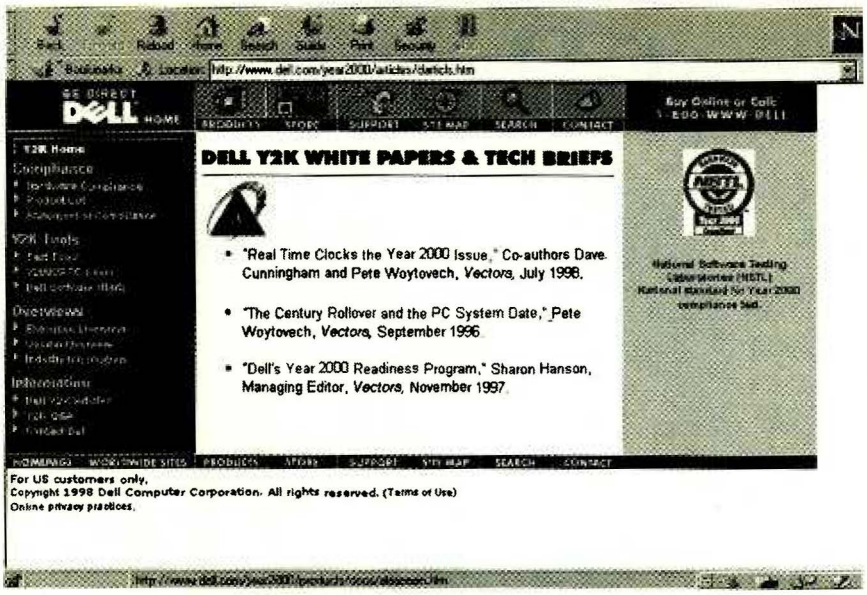
DELL Y2K WHITE PAPERS & TECH BRIEFS
• "Real Time Clocks the Year 2000 Issue," Co-authors Dave Cunningham and Pete Woytovech, Vectors, July 1998.
• "The Century Rollover and the PC System Date," Pete Woytovech, Vectors, September 1996
• "Dell's Year 2000 Readiness Program," Sharon Hanson, Managing Editor, Vectors, November 1997
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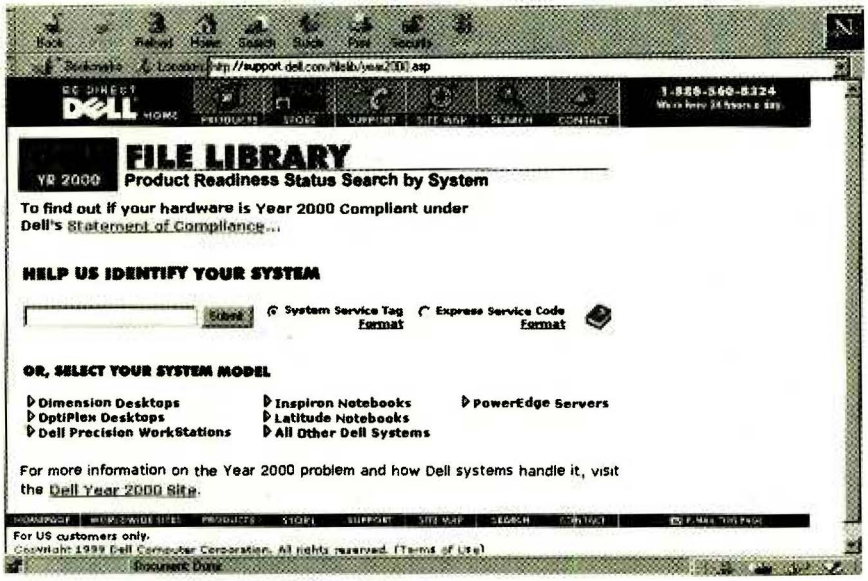
Online privacy practices.

Dell's Web site has some excellent material on the Y2K problem. There's a complete product list of Dell machines, a number of Y2K test tools that can be downloaded, and several easy-to-follow articles on the Y2K problem.


FILE LIBRARY
Product Readiness Status Search by System
To find out if your hardware is Year 2000 Compliant under Dell's Statement of Compliance...
HELP US IDENTIFY YOUR SYSTEM
System Service Tag Format
Express Service Code Format
OR, SELECT YOUR SYSTEM MODEL
Dimension Desktops
OptiPlex Desktops
Dell Precision WorkStations
Inspiron Notebooks
Latitude Notebooks
All Other Dell Systems
PowerEdge Servers
For more information on the Year 2000 problem and how Dell systems handle it, visit the Dell Year 2000 Site.
For US customers only.

If you have a Dell computer, you can check its Y2K status and, if necessary, download a BIOS update or software patch.

First, boot from the floppy disk to the A: prompt and change the date and time to one minute before midnight on December 31 1999, You do that by first typing "date" (without the quotes, of course) at the A: prompt and then typing in the new date (*i.e.*, 12/31/1999). When that's done, type "time" and change the time to 23:59.

Note that this procedure not only changes the operating system clock but also changes the date and time in the BIOS and RTC as well.

Now turn the PC off; wait a couple of minutes; then switch the machine back on and check the date, day, and time in the BIOS (*i.e.*, CMOS) setup. PCs with non-compliant BIOSes will usually drop back to 01/01/1980 or to 01/01/1900, but some will go to 01/01/1994.

Now exit the BIOS setup without making any changes, boot from the floppy disk and check the date—just type "date" at the DOS prompt and hit the ENTER key. If the BIOS previously indicated 01/01/1980, then this date will also be shown when you type "date" at the DOS prompt. However. if the BIOS previously reverted to 01/01/1900, DOS 6.22 will change this to January 4, 1980 (01/04/1980).

You can now check to see what happens when the machine is left on. Once again, boot from the floppy, change the date and time, to a couple of minutes before midnight on December 31,1999 and leave the machine running during the rollover. Now reboot the machine and check the date. If the machine is non-compliant, you will find that the DOS date will be incorrect after the reboot.

Assuming a non-complaint system, try manually setting the date to the year 2000 (e.g., 1/1/2000) in the BIOS setup, then switch the PC off and reboot from the floppy disk. Recheck the date in the BIOS setup, then allow the machine to boot to the A: prompt and check it again. If the year is still 2000, this means that you should only have to reboot the PC and manually alter the date in the BIOS setup once when the year 2000 arrives. After that, the machine should be OK.

Finally, don't forget to reset the date and time to the correct values before booting from the hard disk.

Test Software. While if done carefully, a manual test like the one just described will work, a more reliable (and easier) way of testing your machine is to use one of the many commercial, shareware, and freeware software packages that are now available.

One very good commercial package is Check 2000 PC from Greenwich Mean Time (Web: http://www.gmt-uta.com/). That comprehensive package not only checks your PC for year-2000 compliance, but can also fix any BIOS problems it does find using a BIOS fix utility (for most BIOS types, that is). It can also scan your applications and data files and offer advice on fixing any problems. Other commercial Y2K auditing tools include McAfee 2000 Toolbox, OnMark 2000 Access, Norton 2000, and Express 2000 Suite.

There are also lots of utilities available on the Internet for checking whether your computer will cor-

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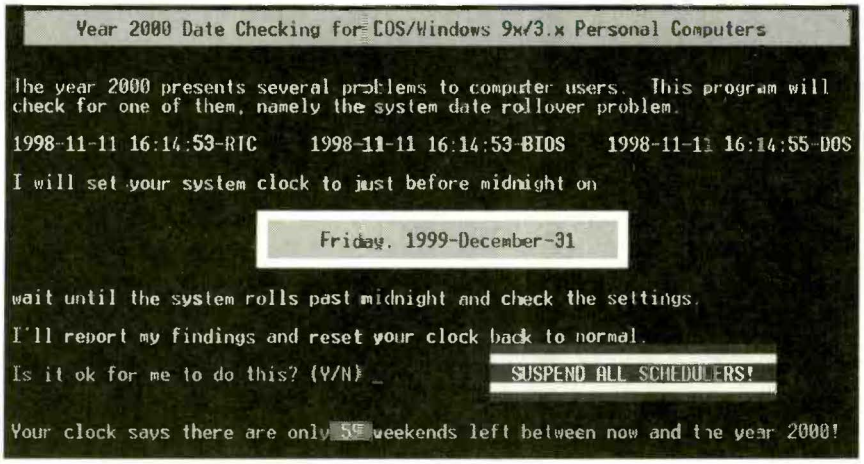
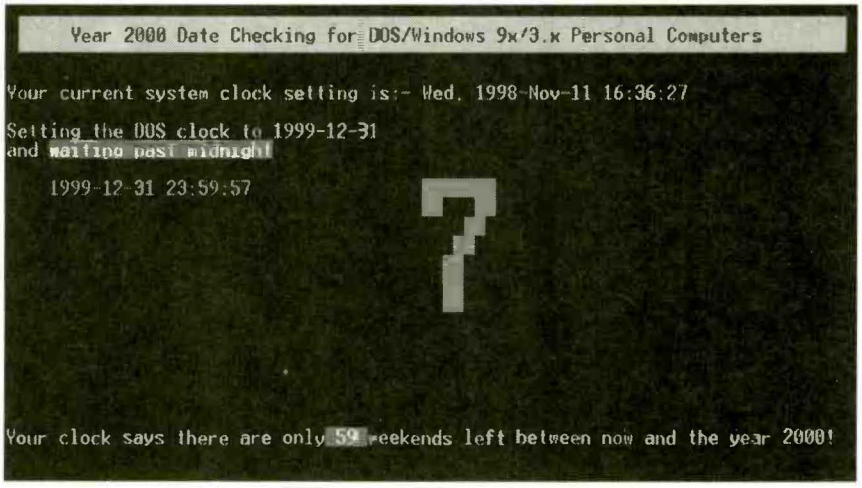
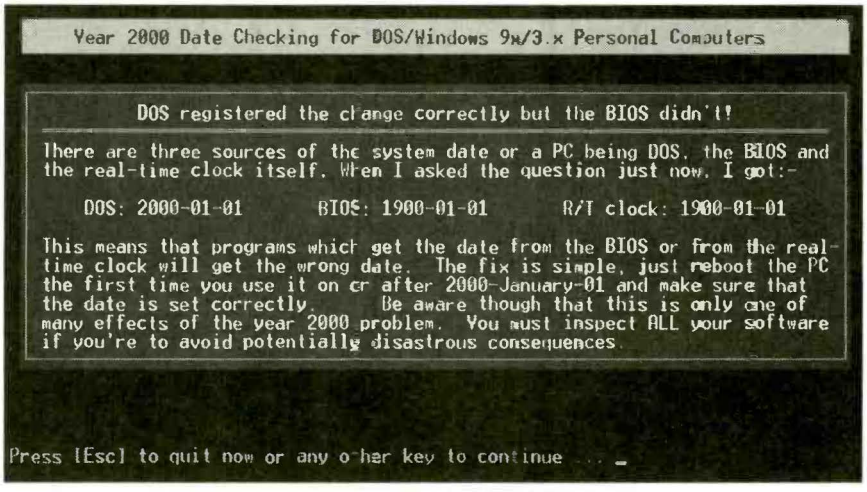

Year 2000 Date Checking for DOS/Windows 9x/3.x Personal Computers
The year 2000 presents several problems to computer users. This program will check for one of them, namely the system date rollover problem.
1998-11-11 16:14:53-RTC 1998-11-11 16:14:53-BIOS 1998-11-11 16:14:55-DOS
I will set your system clock to just before midnight on
Friday, 1999-December-31
wait until the system rolls past midnight and check the settings.
I'll report my findings and reset your clock back to normal.
Is it ok for me to do this? (Y/N) _
SUSPEND ALL SCHEDULERS!
Your clock says there are only 52 weekends left between now and the year 2000!

DOSCHK.EXE is a small utility that can automatically test your PC for Y2K compliance. It starts by saving the current date and time, then resets the time to 5 seconds before midnight on 12/31/1999.


Year 2000 Date Checking for DOS/Windows 9x/3.x Personal Computers
Your current system clock setting is:- Wed, 1998-Nov-11 16:36:27
Setting the DOS clock to 1999-12-31
and waiting past midnight
1999-12-31 23:59:57
7
Your clock says there are only 52 weekends left between now and the year 2000!

Next, the program counts down to midnight on 12/31/1999. An onscreen display shows the progress.


Year 2000 Date Checking for DOS/Windows 9x/3.x Personal Computers
DOS registered the change correctly but the BIOS didn't!
There are three sources of the system date on a PC being DOS, the BIOS and the real-time clock itself. When I asked the question just now, I got:-
DOS: 2000-01-01 BIOS: 1900-01-01 R/T clock: 1900-01-01
This means that programs which get the date from the BIOS or from the real-time clock will get the wrong date. The fix is simple, just reboot the PC the first time you use it on or after 2000-January-01 and make sure that the date is set correctly. Be aware though that this is only one of many effects of the year 2000 problem. You must inspect ALL your software if you're to avoid potentially disastrous consequences.
Press [Esc] to quit now or any other key to continue . . .

Finally the program displays the results and offers advice on a fix. As can be seen, this PC has gone back to 1/1/1900.

rectly roll over to the year 2000. Many of those are free for personal use and are quick and easy to use. As well as checking for year 2000 rollover, many check other critical dates as well.

One example is DOSCHK.EXE from Saphena Computing in the UK. The archived file can be downloaded from their Web site in less than a minute (see the Y2K Web Sites box for Web site address) and you simply copy the unzipped files to a directory on your boot floppy before running the program.

Basically, the program takes the tedium out of having to manually reset the time and date and reboot the computer on several occasions. It's also more comprehensive than the manual reboot test since it separately tests the RTC, the BIOS, and the operating system. A panel summarizes the results at the end of the test.

Another interesting millennium checker is Y2000RTC from Precise Publishing, another UK company. You can download Y2000rtc.zip (around 90 KB) from their Web site (again, see the Y2K Web Sites box) and, after unzipping, run Y2000.exe from DOS or Y2000W.EXE from Windows 3.1x or Windows 95/98.

If problems are discovered, you call install a driver file which, according to Precise Publishing, solves the problem by correcting the RTC. Precise Publishing even states that it can fix the "94" problem associated with Award 4.50G BIOSes. This driver file isn't included in the free test program; it has to be purchased separately.

YMARK2000 from NSTL is also well worth downloading. This interesting utility does more than just check the year-2000 rollover. It also checks for correct leap year support for the years from 2000-2009 and checks the RTC for compatibility with the Motorola M146818 chip (if the RTC isn't compatible, non-DOS operating systems and programs that read the clock directly may fail). In addition, YMARK2000 checks to see if the date can be set manually if the rollover to the year 2000 fails.

By the way, all the above diagnostic programs test the RTC, which invariably fails except on the very latest machines. However, as discussed above, the CMOS RTC date is unimportant unless you have one of those rare programs that accesses it directly. It is the BIOS date that really matters.

Yet another interesting diagnostic program is Test2000 from RighTime. This program first carries out a real-time BIOS rollover test. It then resets the date to 02/29/2000

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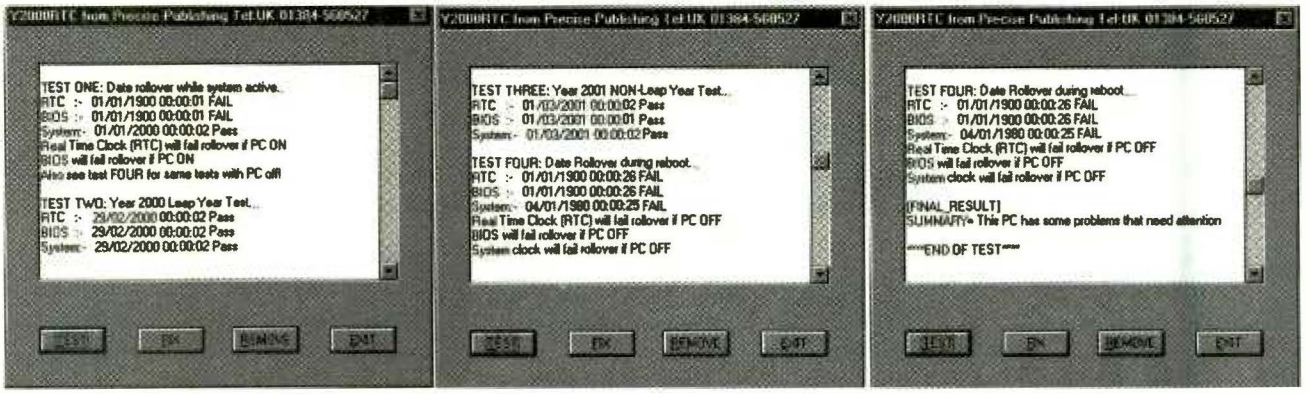

TEST ONE: Date rollover while system active.
RTC :- 01/01/1900 00:00:01 FAIL
BIOS :- 01/01/1900 00:00:01 FAIL
System:- 01/01/2000 00:00:02 Pass
Real Time Clock (RTC) will fail rollover if PC ON
BIOS will fail rollover if PC ON
Also see test FOUR for same tests with PC off
TEST TWO: Year 2000 Leap Year Test...
RTC :- 29/02/2000 00:00:02 Pass
BIOS :- 29/02/2000 00:00:02 Pass
System:- 29/02/2000 00:00:02 Pass
TEST THREE: Year 2001 NON-Leap Year Test...
RTC :- 01/03/2001 00:00:02 Pass
BIOS :- 01/03/2001 00:00:01 Pass
System:- 01/03/2001 00:00:02 Pass
TEST FOUR: Date Rollover during reboot...
RTC :- 01/01/1900 00:00:26 FAIL
BIOS :- 01/01/1900 00:00:26 FAIL
System:- 04/01/1980 00:00:25 FAIL
Real Time Clock (RTC) will fail rollover if PC OFF
BIOS will fail rollover if PC OFF
System clock will fail rollover if PC OFF
[FINAL_RESULT]
SUMMARY= This PC has some problems that need attention
****END OF TEST****
TEST
FIX
REMOVE
EXIT

Y2000RTC is another free diagnostic utility. You can either run Y2000.exe from DOS or Y2000W.EXE from Windows 3.1x or Windows 95/98. These three screen grabs show the test results from a typical 486 PC.

and reboots the machine to see if valid year-2000 BIOS dates are retained (the BIOS retention test). The results are shown onscreen and are also written to a text file called Test2000.tst on the root directory of the hard disk. If the machine is non-compliant, Test2OQO.tst indicates whether the problem can be fixed using a proprietary utility program (Y2KPCPro).

TSRs and BIOS Cards. If your machine tests out to be non-compliant, is there anything that can be done, aside from scrapping it? Though learning that your hardware is non-compliant should be a fairly clear signal that it is time for an upgrade, that might not be feasible or desirable for various reasons. Then, you can try a BIOS upgrade or a TSR patch.

A TSR (terminate and stay resident) patch is basically a software routine that's loaded via the autoexec.bat file when the machine boots. In operation, the TSR fix checks the date in the BIOS and applies a correction if a date prior to 1980 is returned. A TSR isn't exactly foolproof though and might not work with some programs. It will also be lost if you reformat the hard disk drive (unless you remember to reinstall it), or can be inadvertently bypassed if you boot from a floppy disk or CD-ROM.

Alternatively, an add-on BIOS card that plugs into an expansion slot on the motherboard can be used to solve the problem in most machines. Its advantage is that the fix is permanent, but it costs more than a TSR fix.

Basically, the add-on card acts as an extension to the existing BIOS. It works by changing the century register in the RTC to 20 if a value of less than 80 is returned from the year register. However, as with TSR fixes, a BIOS card might not work with some programs. **Electronics Now** reviewed one such BIOS upgrade card—the Micro 2000 Centurion—in the February 1999 issue.

If your motherboard has flash BIOS, you may be able to download and upgrade the BIOS yourself. Just be sure to get the correct BIOS for your particular motherboard from the manufacturer's Web site. A word of warning here: updating the BIOS is not a job for a novice. If you make a mess of things, you could end up with a machine that won't boot.

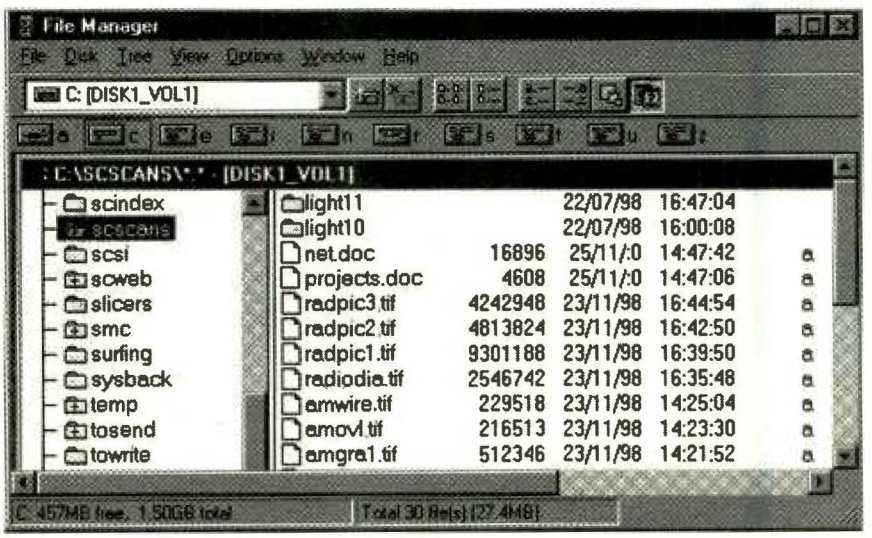
Another approach is to replace the BIOS chip itself. However, that may only be feasible if your machine is less than two or three years old.

Assuming that your hardware checks out fine or can be made compliant, we are in the clear, right? Wrong!

That's because we still have to deal with the software. Both operating systems and applications have significant Y2K issues, and we'll deal with them next.

Operating Systems. Fortunately, Microsoft's operating systems are either year-2000 compliant or compliant with minor issues. They all store and manipulate dates in 4-digit formats and all correctly recognize 2000 as a leap year.

What that means is that Microsoft operating systems won't



The old Windows File Manager will display a garbled year for files created on or after January 1, 2000 if your version of winfile.exe is dated earlier than 3/11/97. A fix is available from Microsoft, but be sure to download the correct version for your operating system.

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break down when the year 2000 rolls around, although you may discover a few quirks.

For example, the File Manager included with Windows 3.1x, Windows For Workgroups, and early releases of Windows 95 will display a garbled year for files created on or after January 1, 2000. The year 2000, for example, displays as 19:0, while 2020 displays as 19<0. Note, however, that these are only display artifacts; the underlying system date is handled correctly.

Basically, your File Manager will have the garbled date problem if your winfile.exe file is dated earlier than 3/11/97. A fix is available from the Microsoft Year 2000 Web site—just be sure to download the correct version for your operating system, as follows: w31filup.exe for Windows 3.1x, wfwfilup.exe for Windows For Workgroups, and w95filup.exe for Windows 95.

Even Windows NT Workstation 4.0 has some quirks and various fixes are available. However, the problems are all of a minor nature and most users won't even notice them.

Whatever version of the Windows operating system you are using, visit the Microsoft Web site and check out the details for yourself.

Applications. This is where the fun really begins. Just because your hardware is Y2K compliant, it doesn't mean that your applications will behave as expected. In particular, applications that specify the year using just two digits can cause problems, and that particularly applies to spreadsheet, accounting, payroll, and database programs.

As an example, if a date in a spreadsheet is specified as 10/21/27, how is it interpreted? Is the year 1927 or 2027? It all depends on the application, but the wrong result could easily make a mess of superannuation calculations or of any calculations that rely on future projections. In fact, a file can even give different results when opened in different versions of the same application.

It's important to ensure that your applications are year-2000 compatible and that the data is interpreted correctly. Many spreadsheet and database programs rely on Windows itself to set the default date display format. For this reason, it's advisable to set the Windows short-date display to "mm/dd/yyyy" using the Regional Settings applet in Control Panel.

Check with the software supplier. Do they have a certificate of compliance or some other guarantee that your software will work correctly? Do you need to upgrade? Answers to these questions are best provided by the company that produced the software.

Check the vendor's Web site for Y2K information. In the case of non-compliant software, it might be possible to make your software compliant by downloading and applying patches. Often, however, it will be better to upgrade your applications to the latest versions and apply any patches (if necessary) from there, particularly for applications that are used in business.

By the way, it's not sufficient just to bring individual computers and applications up to speed. If you are

Y2K WEB SITES

The Year 2000 Problem

www.microsoft.com/year2000/	Microsoft's year 2000 Web site. Lots of information on operating systems and applications, plus numerous links to various diagnostic utilities, etc.
www.novell.com/year2000/	Information on Novell products and Y2K compatibility.
www.year2000.com	Lots of information on the Y2K problem plus links to manufacturers.
www.sba.gov/y2k/	Year 2000 Web site for the US Government Small Business Administration.
www.garynorth.com/	The Year The Earth Stands Still—an interesting viewpoint on the year 2000 problem. Read it if you're still complacent.

Some Useful Y2K Diagnostic Utilities

ourworld.compuserve.com/homepages/saphena/year2000.htm	Saphena Computing's DOSCHK.EXE diagnostic utility.
www.precise.co.uk/Y2000.htm	Precise Publishing's Y2000RTC.zip diagnostic utility.
www.nstl.com/html/nstl_ymark2000.html	NSTL's YMARK2000 diagnostic utility.
www.RighTime.com	RightTime's Test2000 diagnostic utility.

Computers Suppliers &Y2K

www.dell/com/year2000/	Lets you check your Dell system for compliance. BIOS updates and drivers can be downloaded if necessary.
www.gateway.com/year2000/	Gateway's Year 2000 site
www.ibm.com/IBM/year2000/	IBM's Year 2000 site
www.compaq.com/year2000/	Compaq's Year 2000 site

Global Positioning Satellite (GPS) Navigation System

www.navcen.uscg.mil/gps/geninfo/y2k/default.htm	GPS date rollover issues plus a list of GPS manufacturers.

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in business, you must consider what happens when you exchange data with others, either via a local network, via e-mail, or by some other means. You also have to consider what happens if you exchange data between different applications.

Look out for all the small things—things like third party add-ons, macros, and formulas in spreadsheets and other applications. Those can all have problems, especially if you've been using a two-digit year format. They can even cause problems with applications that are, by themselves, year-2000 compliant.

Finally, it's important to realize that here's no magic cure-all for the Y2K problem. Everything must be tested on its own merits and the appropriate solutions implemented. But even though most of the problems are well known, not many of the thousands of individuals specializing in the Y2K problem will give a 100% guarantee that their solutions will work without any hiccups.

What About Apple Computers? Does the fact that we've been mainly dealing with Windows systems mean you can afford to be a little smug here if you own an Apple Mac? Maybe.

According to Apple, the Mac operating system has always correctly handled dates between January 1, 1904 and February 6, 2040. What's more, the current Mac OS date and time utilities correctly handle dates between 30,081 BC and 29,940 AD.

Apple also states that all applications that use the Mac OS date and time utilities will have no problem when the year 2000 rolls around. However, there could be problems with applications that don't do this. Once again, it's best to check with the company that supplies the software.

One issue affecting the Apple Mac is that the date and time control panel only allows the year to be set in the range from 1920-2019. However, it's possible to set dates beyond 2019 using the SetDateTime toolbox.

For more information on Apple hardware and software Y2K issues, visit the Apple Web site (www.apple.com/about/year2000).

HOW TO MANUALLY TEST YOUR PC FOR THE YEAR 2000

Step 1: Boot from a floppy disk created using DOS 6.22 or later.
Step 2: Type "date" (without the quotes) and change the date to 31-12-1999.
Step 3: Type "time" and change the time to 23:59 (i.e., to one minute before midnight).
Step 4: Switch off, wait for two minutes, then re-apply power and enter the BIOS setup. Check the date. If the year isn't 2000, then your machine is non-compliant.
Step 5: Exit the BIOS setup without saving and allowing the machine to boot from the floppy disk.
Step 6: Type "date." Machines with non-compliant BIOSes will usually show either January 1st 1980 or January 4th 1980.
Step 7: Reset the date and time to the correct values.

Embedded Controllers. It's not only computers that could have problems handling the transition to 2000. Many of today's so-called "high-tech" systems contain embedded controllers. That includes medical equipment, car computers, traffic lights, VCRs, industrial process control, office equipment, PABXs, air-conditioning plants, building access controls, and alarm systems, to name just a few.

Of course, only some of these controllers are date dependent, but those that are could cause problems in the year 2000 if not replaced or modified. The effects, of course, will depend on the equipment. In some cases, the equipment will continue to operate normally (although it will report the wrong date) but in other cases, the equipment could malfunction or cease working altogether.

Y2K Web Sites. It should come as no surprise that there's a wealth of information on the World Wide Web on the Y2K problem, and it's well worth visiting some of the sites listed in the accompanying Y2K Web Site box. It's also a good idea to check out the Web sites for your BIOS supplier and your computer (and/or motherboard) supplier. They will have tested many more dates and times than you would normally be able to check and might have patches or BIOS updates available for older PCs.

One site that's especially well worth checking out is www.microsoft.com/year2000. This large site hosts detailed information on Microsoft operating systems and applications and includes Y2K fixes that you can download and apply to any problem programs. It also has links to year 2000 "White Papers," a section with frequently asked questions (FAQs), and links to external suppliers and companies offering Y2K diagnostic utilities.

Another site that you should check out is www.year2000.com. And, if after all this you still feel complacent about the problem, check out Gary North's site: www.garynorth.com for some very frightening projections.

Conclusion. This article is intended as a general guide to the year-2000 problem only, and is by no means exhaustive. Because of the wide variations that exist in computer hardware, operating systems, and applications, it is impossible to offer specific advice that covers all situations. In fact, while the procedures, diagnostics, and products presented here are effective in most situations, they might not be in yours. If in doubt, seek professional help, especially if computers and the data they hold are critical in your business.

In short, if you are involved in any sort of business that operates computers, then you cannot afford to ignore the year-2000 problem. In particular, it's vital that you seek professional help in overcoming year-2000 problems and that all systems and applications be thoroughly tested well before 2000 rolls around. Ω

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